

NITRIC OXIDE AS A FUMIGANT FOR POSTHARVEST PEST CONTROL

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Summary

Nitric oxide is an effective fumigant against insects under ultralow oxygen atmospheres. For insect pests of fresh commodities, all insects including western flower thrips, lettuce aphid, mealybugs, light brown apple moth, spotted wing drosophila, and codling moth can be controlled in relatively short time periods at a low temperature in 2 to 24 h depending on nitric oxide concentration and insect species. Nitric oxide fumigation is also safe to fresh products when it is terminated by flushing with nitrogen to reduce the nitric oxide level in the fumigation chamber first before exposing products to ambient air to avoid reaction between nitric oxide and oxygen. Nitric oxide fumigation was also found to improve postharvest quality of strawberries in comparison with controls. Therefore, nitric oxide fumigation is expected not only to control pests but also increase shelf-life of some fresh commodities. This can bring important benefits to some delicate fresh products with short shelf-life.

Nitric oxide fumigation can be cost effective as compared with low temperature phosphine fumigation. The costs of nitrogen generation equipment and energy cost for producing nitrogen gas are moderate and are expected to be acceptable. However, because of short treatment times for most fresh product pests, nitric oxide fumigation treatments can be conducted in non-refrigerated fumigation chambers and fumigation chambers can be used more efficiently. The low temperature phosphine fumigation has much longer treatment time as compared with nitric oxide fumigation for controlling same insect species and likely requires a high number of refrigerated fumigation chambers which are expected to have a much higher cost.

All laboratory experiments and analyses suggest that nitric oxide fumigation can be a safe, effective, and economical alternative solution to postharvest pest problems on internationally traded fresh commodities.